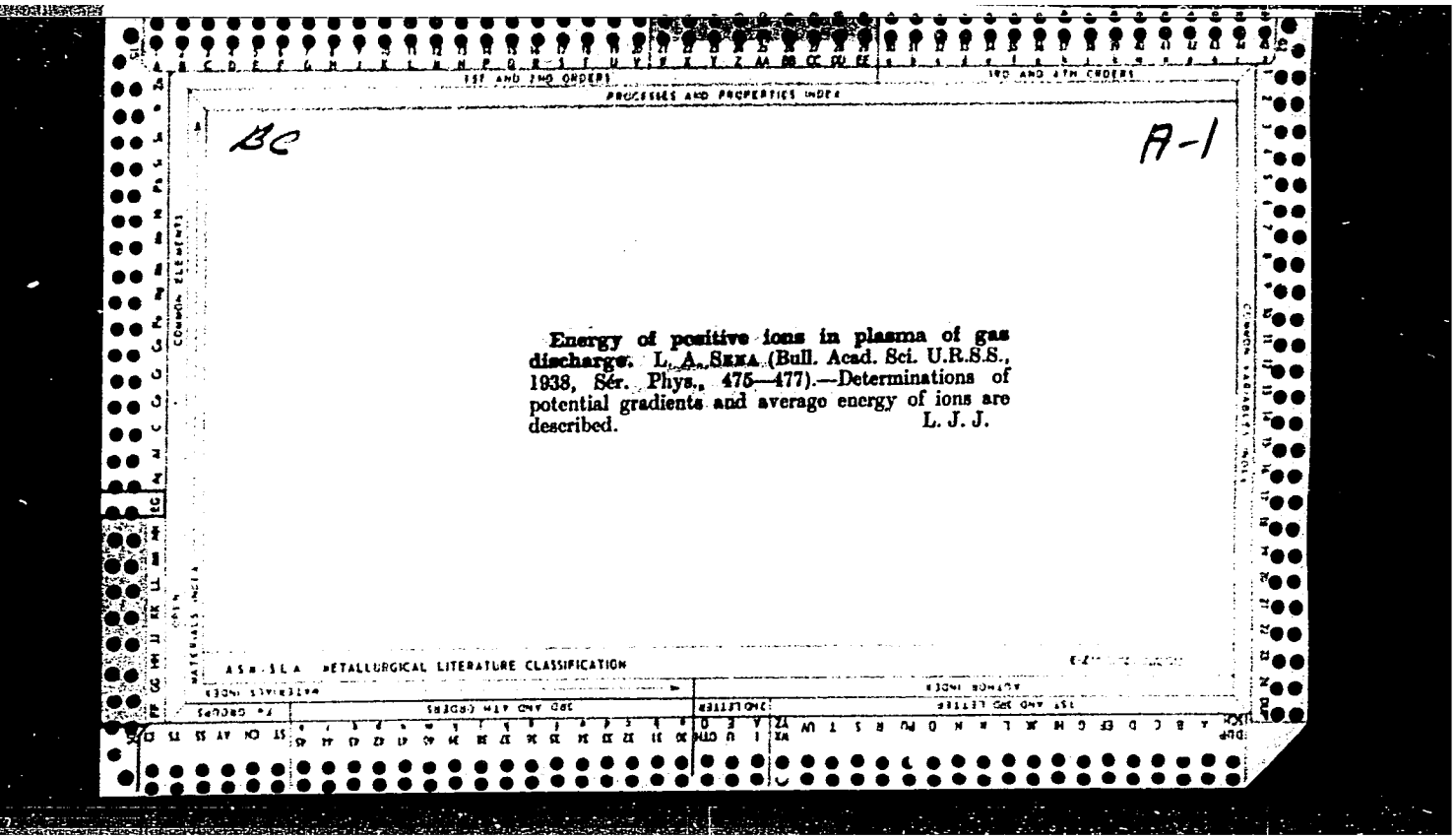
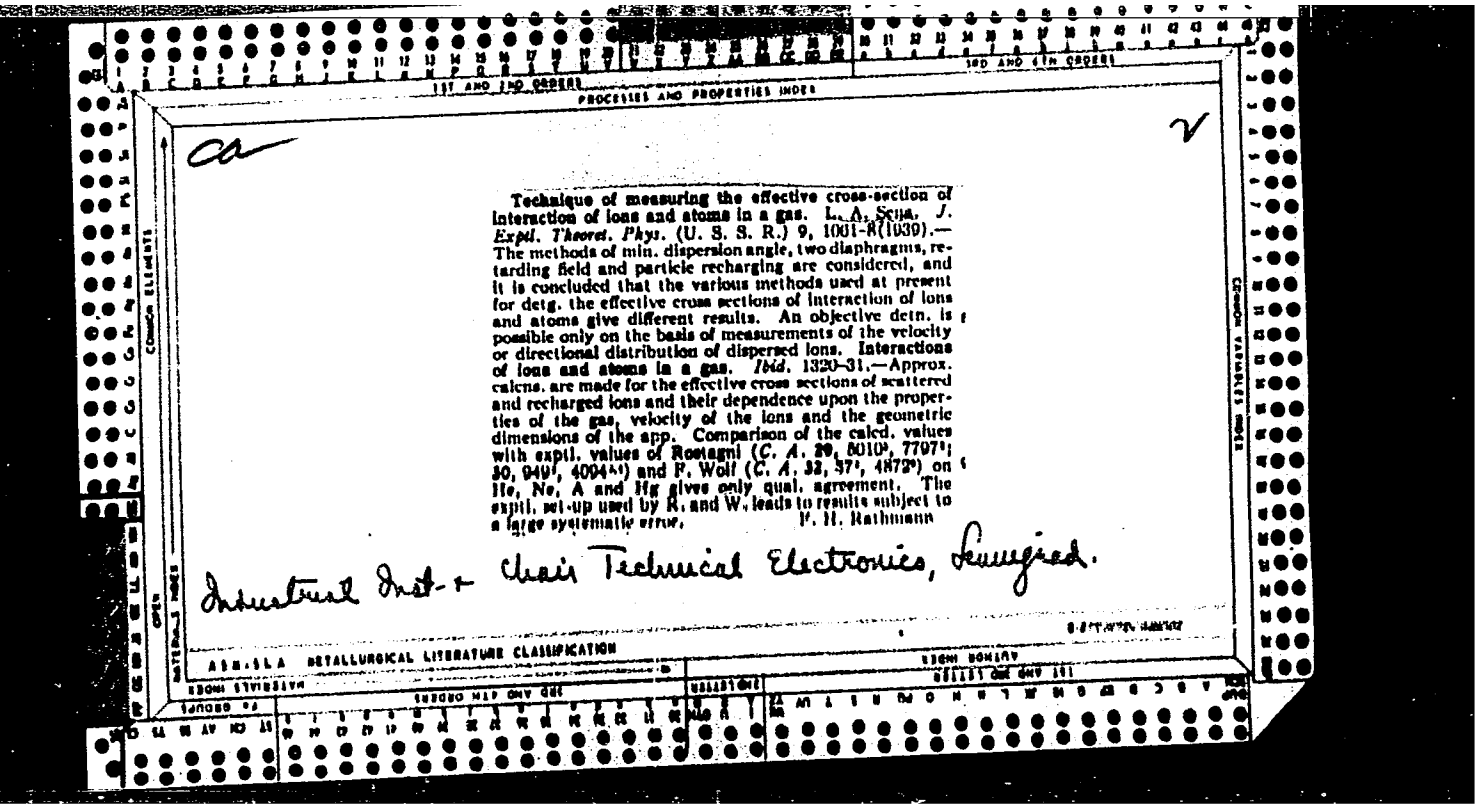


BC

A-1

Energy of positive ions in plasma of gas discharge. L. A. Sena (Bull. Acad. Sci. U.R.S.S., 1938, Sér. Phys., 475—477).—Determinations of potential gradients and average energy of ions are described. L. J. J.

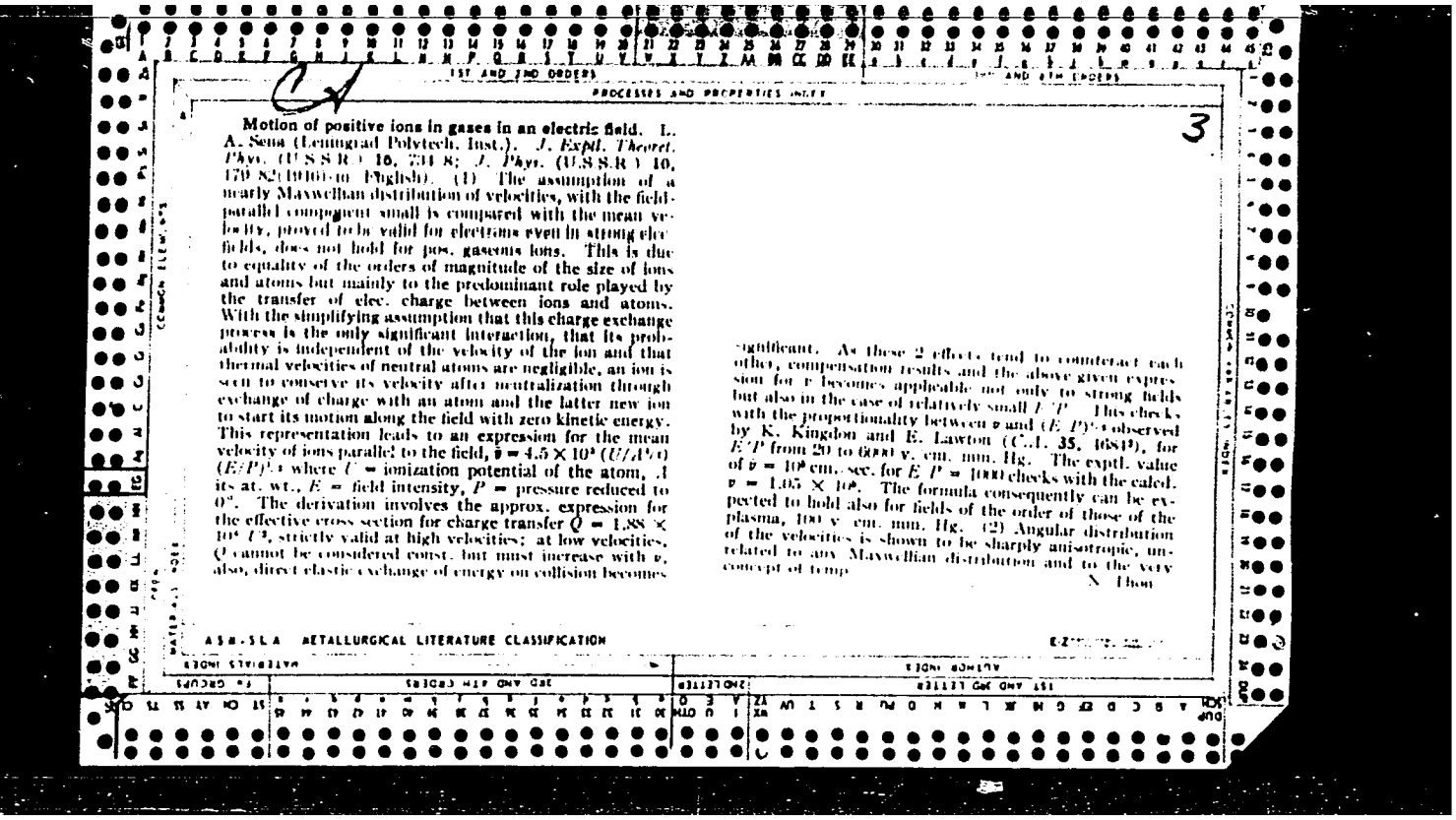


PROCESSES AND PROPERTIES INDEX

Technique of measuring the effective cross-section of interaction of ions and atoms in a gas. L. A. Sena. *J. Expil. Theoret. Phys.* (U. S. S. R.) 9, 1001-8(1939).—The methods of min. dispersion angle, two diaphragms, retarding field and particle recharging are considered, and it is concluded that the various methods used at present for detg. the effective cross sections of interaction of ions and atoms give different results. An objective detn. is possible only on the basis of measurements of the velocity or directional distribution of dispersed ions. Interactions of ions and atoms in a gas. *Ibid.* 1320-31.—Approx. calcns. are made for the effective cross sections of scattered and recharged ions and their dependence upon the properties of the gas, velocity of the ions and the geometric dimensions of the app. Comparison of the calcd. values with expil. values of Rostagni (*C. A.* **29**, 8010[9], 7707[1]; **30**, 940[9], 4004[A1]) and F. Wolf (*C. A.* **32**, 97[1], 4872[9]) on He, Ne, A and Hg gives only qual. agreement. The expil. set-up used by R. and W. leads to results subject to a large systematic error. F. H. Rathmann

Industrial Inst + Chair Technical Electronics, Semmfied.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3

Motion of positive ions in gases in an electric field. L. A. Sena (Leningrad Polytech. Inst.). *J. Expl. Theoret. Phys.* (U.S.S.R.) **16**, 734-8; *J. Phys.* (U.S.S.R.) **10**, 170-82(1946)(in English). (1) The assumption of a nearly Maxwellian distribution of velocities, with the field-parallel component small is compared with the mean velocity, proved to be valid for electrons even in strong elec fields, does not hold for pos. gaseous ions. This is due to equality of the orders of magnitude of the size of ions and atoms but mainly to the predominant role played by the transfer of elec. charge between ions and atoms. With the simplifying assumption that this charge exchange process is the only significant interaction, that its probability is independent of the velocity of the ion and that thermal velocities of neutral atoms are negligible, an ion is seen to conserve its velocity after neutralization through exchange of charge with an atom and the latter new ion to start its motion along the field with zero kinetic energy. This representation leads to an expression for the mean velocity of ions parallel to the field, $\bar{v} = 4.5 \times 10^5 (U/A^{1/2})(E/P)^{1/2}$ where U = ionization potential of the atom, A its at. wt., E = field intensity, P = pressure reduced to 0°. The derivation involves the approx. expression for the effective cross section for charge transfer $Q = 1.88 \times 10^{-8}/U^2$, strictly valid at high velocities; at low velocities, Q cannot be considered const. but must increase with v, also, direct elastic exchange of energy on collision becomes significant. As these 2 effects tend to counteract each other, compensation results and the above given expression for v becomes applicable not only to strong fields but also in the case of relatively small E/P. This checks with the proportionality between v and $(E/P)^{1/2}$ observed by K. Kingdon and E. Lawton (C.A. **35**, 6849), for E/P from 20 to 6000 v. cm. mm. Hg. The exptl. value of $v = 10^6$ cm. sec. for $E/P = 1000$ checks with the calcd. $v = 1.05 \times 10^6$. The formula consequently can be expected to hold also for fields of the order of those of the plasma, 100 v. cm. mm. Hg. (2) Angular distribution of the velocities is shown to be sharply anisotropic, unrelated to any Maxwellian distribution and to the very concept of temp.

N. Thon

A.S.M.-S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

SENA, L. A.

On the Electron Velocity Distribution in the Plasma. / L. A. Sena. *Journal of Experimental and Theoretical Physics* (U.S.S.R.), v. 16, no. 9, 1946, p. 811-814. (In Russian.)

Contains results of measurements of the electron velocity distribution in a discharge tube for different anode current values at two points on the cathode. Analysis of the characteristics obtained indicate that interaction of electrons in the process of formation of Maxwell's distribution is an important factor.

discharge
Elect. Bell

SENA, L. A.

Sep 1947

USSR/Electricity
Cathodes, Mercury
Ignition

"Investigating the Reverse Ignition of Apparatus with Mercury Cathodes," A. E. Askinasi, (deceased), M. A. Gurevich, Engr, L. A. Sena, Leningrad Polytechnical Institute imeni Kalinin, 8 pp

"Elektrichestvo" No 9

Reverse ignition is one of the greatest faults of systems with mercury cathodes and very often leads to serious damage to the whole apparatus. In the laboratory, the authors studied the relationship of the frequency of the reverse ignition to the discharge circuit and the peculiarities of the cathode. This report was presented at the 1946 Research and Investigation Conference of the Leningrad Polytechnical Institute imeni Kalinin.

PA 29T29

SENA, L. A.

Edinitsy izmereniia fizicheskikh velichin. 2. perer. izd. Leningrad, Gostekhizdat, 1948. 186 p. diagrs.

Bibliography: 1 p. at end.

DLC: QC39.S46 1948

Units of physical measurements.

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

SENA, L.A.; VAVILOV, S.I., akademik, redaktor; IOFFE, A.F. akademik, redaktor; LUKIRSKIY, P.I., akademik, redaktor; FOK, V.A., akademik, redaktor; FRENKEL', Ya.I., redaktor; SHUL'MAN, A.P., redaktor; VOLCHOK, K.M., tekhnicheskiy redaktor.

Collisions of electrons and ions with gas atoms] Stolknoveniia elektronov i ionov s atomami gaza. Leningrad, Gos.izd-vo tekhniko-teoret.lit-ry 1948. 215 p. [Microfilm] (MLRA 10:6)

1. Chlen-korrespondent AN SSSR (for Frenkel')
(Collisions (Nuclear physics))

SENA, L. A.

"Units of Measurements of Physical Quantitite. Second Edition", Moscow. Leningrad: State Technical Press, 187, pp, 1949.

SENA, L. A. (Prof. Dr. of Physicomathematical Sciences)

"Physical Processes in High-Voltage Mercury-Arc Rectifiers," reported in the article "First All-Union Scientific and Technical Session on Mercury-Arc Rectifiers," Elektrichestvo, No. 11, 1949.

Abstract W 9395, 10 Apr 1950.

Charge exchange between mercury atoms and ions B. M. Palyukh and L. A. Sena (D. C. Research Inst., Leningrad). *Zhur. Eksptl. Teoret. Fiz.* 20, 481-91(1950) —From current-voltage characteristics obtained by the 3 methods of the slowing-down field, const. ion velocity, and const. collector potential, the effective cross sections for the exchange of an electron between ions and neutral atoms of Hg were detd. to 351, 316, 286, and 258 sq. cm./cc. mm. Hg for ions of 75, 165, 425, and 990 e.v., resp. The effective cross-section decreases regularly with increasing velocity of the ions, tending, at very high velocities, to the value of 174 calcd. without taking into account the tunnel-effect. N. Thon

SENA, L. A.

Units of physical measurement. 3. izd. Moskva, Gos, izd-vo tekhniko-teoret. lit-ry, 1951. 184 p. (51-34873)

QC39.S46 1951

1

2

Distribution of the density of mercury vapor in the presence of an evaporating and a condensing liquid mercury surface. R. Ya. Barskaya, N. A. Denisyuk, and L. A. Sena. *Zhur. Tekh. Fiz.* 21, 1005-7(1951).—The vapor d. distribution was measured, as a function of the position of the measuring ionization densitometer, between 2 surfaces of liquid Hg, 32 cm. apart, kept either at the same temp. of 12 or 28°, or at different temps., 12 and 28°. In the 1st instance, the d. is uniform over the whole distance. In the 2nd instance, it is uniform almost over the whole distance, except in the immediate vicinity of the liquid surfaces where there is a gradient of the vapor d. The ranges of these regions are of the order of the mean free path of the Hg mols. at the corresponding vapor densities.

N. Thon

SENA, Lev Aronovich; CHERNAYA, S.A., redaktor; GAVRILOV, S.S., tekhnicheskiy redaktor

[Luminescent tubes] Svetiashchiesia trubki. Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1956. 54 p. (Nauchno-populiarnaia biblioteka, no.88) (MLRA 10:1)
(Fluorescent lighting)

GOLUBCHIN, G.N., inzhener; SENA, L.A., doktor fiziko-matematicheskikh nauk.

Importance of mercury drops in the occurence of arc-backs. Elektrichestvo no.6:60-65 Je '56. (MIRA 9:9)

1.Nauchno-issledovatel'skiy institut postoyannogo yoka.
(Electric current rectidiers)

Card 1-14

Category : USSR/Electronics - Gas Discharge and Gas-Discharge Instruments H-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1706

Author : Sena, L.A., Taube, N.S.
Inst : Sci. Res. Inst. for DC of the Ministry of Elec. Stations, USSR
Title : "Contact" Phenomena in Plasma.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 2, 287-290

Abstract : Drude's basic concepts of the classical theory of metals are applied to the study of "contact" phenomena in gas-discharge plasmas. The equation for the potential jump at the contact between metals having different temperatures and free-electron concentrations are used to obtain an expression for the potential jump at the boundary between two plasmas. If the plasmas differ only in their concentrations, the potential jump is given by $V = kT/e \ln n_2/n_1$. Calculations made with this equation are compared with measured potential differences on the boundary of two plasmas, produced in a special tube with the aid of two anodes. The measured values are somewhat higher than those calculated, owing to some degree to the method chosen in this investigation to measure the potential difference.

Card : 1/1

SOV/109-3-8-17/18

AUTHORS: Alekseyeva, A.P., Basalayeva, N.Ya., Yelinson, M.I., Zernov, D.V., Kul'Varskaya, B.S., Lifshits, T.M., Savitskaya, Ya.S., Sena, L.A., Shabel'nikova, A.E. and Yurasova, V.Ye.

TITLE: The Eighth All-Union Conference on Cathode Electronics (8-ye vsesoyuznoye soveshchaniye po katodnoy elektronike)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 8, pp 1092 - 1103 (USSR)

ABSTRACT: The conference took place during October 17 - 23, 1957, in Leningrad at the Fiziko-tekhnicheskiy institut AN SSSR (Physics-engineering Institute of the Ac.Sc. USSR). It was organized by the Soviet Ac.Sc. and was attended by Soviet scientists from Moscow, Leningrad, Kiyev and other towns of the Soviet Union as well as by delegates from Hungary, Czechoslovakia and Romania. Altogether, over one hundred lectures were delivered at the conference. These were divided into the following sections: thermionic emission and the technology of thermionic cathodes; secondary electron emission; photo-electron emission; field electron emission; cathode conductivity phenomena; ionic processes and gas discharges. Some of the papers

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read at the conference are published in the present issue of the journal: in fact, all the papers in this issue were read at the conference. Some of the papers were published in an earlier issue of the journal (Vol 2, Nr 12, 1957). A number of papers from the conference are being published in "Izvestiya AN SSSR, Ser. Fiz". Nrs 4 and 5 and also in various other journals. The present report gives brief summaries of a large number of the papers presented at the conference.

SUBMITTED: February 4, 1958

Card 2/2 1. Cathodes (Electron tube) 2. Thermionic emission 3. Secondary emission 4. Photoemission 5. Field emission

SOV/105-58-9-22/34

AUTHOR: Sena, L. A., Professor, Doctor of Physical and Mathematical Sciences

TITLE: An Intuitive Deduction of the Mirror-Image Field (Naglyadnyy vyvod polya zerkal'nogo izobrazheniya)

PERIODICAL: Elektrichestvo, 1958, Nr 9, pp 86 - 86 (USSR)

ABSTRACT: A plane MN separates the conductor occupying the right half-space of the vacuum where at a certain distance from the MN plane there is a system of immobile charges Σq. Due to electrostatic induction, a surface charge of inverse sign is imparted to the MN plane. This charge will be distributed in such a way that the potential of the resultant field will be zero at all points of the conductor. This resultant field is composed of the field due to the system of charges E_q, and of that due to the surface charges E_{MN}. Therefore, for a fixed, arbitrary point A inside the conductor $E_q+E_{MN}=0$. Consequently, the surface charge on the MN plane produces at the point A a field strength $E_{MN} = -E_q$. In other

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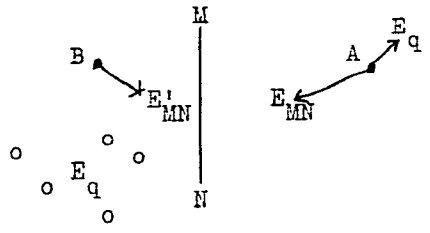
words, the field strength will be the same as caused at the same point by a system Σ (-q) of equal charges, but of inverse sign each. Since the charge on the MN plane is a surface charge, the field due to this charge will be symmetrical on either side of MN. Therefore the field strength at the point B lying symmetrically to the point A on the left of MN is represented by the vector E'_{MN}, being the mirror image of the vector E'_{MN}. Consequently, the field strength E'_{MN} is equal to such a field strength as would be caused by a system of charges Σ (-q) lying in the right of the MN plane symmetrically as a mirror image to the system of charges, Σq.



SOV/105-59-2-16/25

8(3)

AUTHORS: ~~Sena, L. A.,~~ Doctor of Physical-Mathematical Sciences, Golubchin, G. N., Engineer

TITLE: On the Possibility of Protecting the Anode of a Mercury-Arc Valve From Mercury Drops Being Spattered by the Cathode Spot (O vozmozhnosti zashchity anoda rtutnogo ventilya ot kapel' rtuti, razbryzgivayemykh katodnym pyatnom)

PERIODICAL: Elektrichestvo, 1959, Nr 2, pp 66-69 (USSR)

ABSTRACT: In the papers (Refs 1, 2) it was shown that the most important factor, being able to cause arc-backs in a Hg-arc valve, is the impact of Hg-drops at the anode. The method of screening the anode and the tests by means of which the efficiency of this method was proved are given. The tests showed that the most commonly used methods of screening the anode, at devices equipped with a mercury cathode, do not ensure a safe protection from impact of Hg-droplets on the anode, as these methods do not take care of the possibility of a reflection of the droplets at the intermediate surfaces. A safe anode screening is only possible with a zigzag discharge path with peaked changes in direction. It is suitable to grant simultaneously the possibility to let the drops pass at the points where the

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SOV/109-4-8-22/35

SENA, L.A.

AUTHORS: Granovskiy, V.L., Lukyanov, S.Yu., Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

ABSTRACT: The conference was organized by the Ac.Sc.USSR, the Ministry of Higher Education and Moscow State University. It was opened by the chairman of the organizing committee, M.A. Leontovich, Academician. During the plenary sessions of the conference, a number of survey papers were delivered. L.A. Artsimovich read a paper on "Production of Ultra-high Temperatures in Plasma".
A survey of the optical method of measurements was given in the papers by V.A. Fabrikant and S.E. Frish.
S. Brown of the Massachusetts Institute of Technology gave a survey of the high-frequency methods of the investigation of stationary and non-stationary plasma (see p 1344 in this issue of the journal).
M.V. Fedorenko read a paper entitled "Ionization and Inelastic Scattering During Atomic Collisions".
In A. Zeman and Yu.M. Kagan dealt with "Elementary Processes of Determining the Motion of Ions in Gas".
A paper by Ye. Bederau (Rumania) dealt with "The Role of Resonance-Recharging in the Kinetics of Ions".
I.S. Stekol'nikov considered the initial stages of the development of sparks (corona-leader, main channel and the final channel).
B.N. Klyarfel'd gave a survey of the ignition processes of the discharges in highly rarified gases.
The mechanism of the breakdown of a high-vacuum gap was elucidated in a paper by V.L. Granovskiy.
L. Tonks (USA) expounded a theory of the motion of electrons in a magnetic trap (see p 1316 of this journal).
Academician R. Rompe (Eastern Germany) described a number of experiments on non-stationary plasma conducted by himself.
M. Steenbeck (Eastern Germany) gave a generalized theory of plasma. The conference was divided into six sections. The first section was presided over by L.A. Sena and was concerned with the elementary processes in gas discharges. The following papers were read in this section:
Ya.M. Fogel' - "Transformation of Positive Ions Into Negative Ones in Rarified Gases".
Ya. M. Fogel' with V.A. Ankudinov and D.V. Pilipenko - "Capture and Loss of Electrons During the Collision of Fast Atoms of Carbon and Hydrogen with the Molecules of Gases".
M.V. Fedorenko et al. - "Dissociation of Molecular Ions of Hydrogen During Collisions in Gas".
I.P. Flaks and Yu.S. Solntyev - "Capture Cross-sections of Electrons in Multicharge Ions in Inert Gases".
R.M. Kushnir et al. - "Experimental Investigation of the Resonance Recharging in Certain Single-atom Gases and Metal Vapours".
O.B. Firsov - "Qualitative Investigation of Inelastic Collisions of Atoms".
L.M. Volkova - "Effective Excitation Cross-sections of the Spectral Lines of Potassium and Argon".
Card3/15 I.P. Zapesochnyy and S.N. Kishko "Some Results of the Investigation of the Optical Functions of the Excitation Bands of a Negative System".
A.A. Vorob'yev and A.G. Vlasov - "Investigation of the Scattering of the Electrons in a Betatron Chamber".
The second section was presided over by B.N. Klyarfel'd and was devoted to the problems of the electrical breakdown in rarified gases and in high vacuum. The following papers were read in this section:
G.Ye. Makar-Limanov and Yu.A. Matlitskiy - "Electrostatic Control of the Ignition of Glow-discharge Tubes" (see p 1278 of the journal).
E.V. Pitsyn et al. were concerned with the breakdown in a high-voltage mercury rectifier (see p 1278 of the journal).
L.G. Guseva "Ignition of the Discharge in Non-uniform Fields at Low Gas Pressures" (see p 1260 of the journal).
A.S. Sobolev and B.N. Klyarfel'd - "The Discharge Phenomena Between a Point and a Plane at Gas Pressures of 10^{-3} - 1 mm Hg".

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66702

24(3)
AUTHOR: Sena, L. A., Doctor of Phys.-Math. Sciences (Leningrad) SOV/105-59-6-6/28

TITLE: On the Comparative Advantages of Different Systems of Units (O sravitel'nykh preimushchestvakh razlichnykh sistem yedinits)

PERIODICAL: Elektrichestvo, 1959, Nr 6, pp 23-27 (USSR)

ABSTRACT: In the course of several years articles have been published in Soviet and foreign scientific literature, in which the authors attempt to motivate the fundamental advantage of a number of systems of units by various ways of argumentation. In reality the case is that, if one of the systems would exhibit clearly discernible advantages, it would put the others all out of their place and provide enough substantiation to replace the other systems. No such thing has, however, actually occurred, and a predominating system has never been established. Moreover, this cannot be done, as in choosing a system of units we have, for fundamental reasons, an unlimited choice of possibilities, thus:
1) The number of fundamental units may be both as large and as small as possible.
2) The choice of the quantities, the units of which are taken as basic magnitudes, is entirely fortuitous.

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3) The choice of the magnitude of the fundamental units is entirely fortuitous.
4) A high degree of arbitrariness is found in the choice of the laws and definitions, which are used as relationships determining the derivative units.

Conclusions: From a fundamental viewpoint the existing systems of units are all equivalent, as the number of fundamental units, their choice and the choice of the defining relationships is to a high degree fortuitous.
2) In establishing systems of units it is necessary to be guided by practical considerations. As they are differing from one field of science and engineering to another, it is not useful to standardize only one system.
3) A sufficiently wide range of requirements can be satisfied if two systems are legalized, the SGS system (in the symmetrical (Gaussian) variant) and the MKSA system in its standard definition. Both systems should be considered entirely equal.
4) Drafts have been advanced concerning a partial alteration of the MKSA system by substituting one of the defined constants by another or by modifying the definition of several units (D and H). Such changes would offer no practical or even fundamental advantages. On

the contrary, they would result in considerable changes in generally adopted expressions and generally adopted units, and hence, they are considered unsuitable. There are 6 references, 4 of which are Soviet.

SUBMITTED: February 11, 1959

SOV/48-23-8-16/25

24(7)

AUTHORS: Kushnir, R. M., Palyukh, B. M., Sena, L. A.

TITLE: An Investigation of the Resonance Charge Exchange in Monatomic Gases and Metal Vapors

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 8, pp 1007-1011 (USSR)

ABSTRACT: Resonance charge exchange is an important process of interaction between ions and atoms. Knowledge of the cross section of resonance charge exchange and of the dependence of the latter on the velocity of ions is very important. In the introduction of the present paper the results of numerous investigations (Refs 1-6) are discussed. In the laboratory of L'vovskiy gosudarstvennyy universitet im. I. Franko (L'vov State University imeni I. Franko) the cross section of resonance charge exchange was measured for argon, krypton, xenon, potassium, and cesium, similar to measurements for mercury vapor made by the Leningradskiy NII. The results of all these measurements are investigated and compared with theory. Experimental measurements were accomplished by the method of retarded field, similar to methods used by the authors in previous investiga-

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An Investigation of the Resonance Charge Exchange in Monatomic Gases and Metal Vapors

tions (Ref 6). In the first part, the results of measurement are discussed, and the mean values of the cross sections are listed in a table. There is good agreement between experimental and theoretical results, with the exception that the experimental dependence of the cross section on the ionic velocity increases in the range of low velocity to a larger extent than the theoretical dependence. In general, it was found that the cross section decreases in a monotonic manner with increasing ionic velocity and depends on the ionization potential of the gas. There are 4 figures, 1 table, and 12 references, 8 of which are Soviet.

ASSOCIATION: L'vovskiy gos. universitet im. Iv. Franko (L'vov State University imeni Iv. Franko)

SENA, L.A.; FRIDLYAND, R.M.

Formation of the cathode spot on the mercury-dielectric boundary in ionized gas. Zhur.tekh.fiz. 29 no.1:3-11 Ja '59. (MIRA 12:4)

1. Nauchno-issledovatel'skiy institut postoyannogo toka, Leningrad.
(Cathodes) (Electric discharges through gases)

ABRAMOVICH, G.P., inzh. (Gomel'); SENA, L.A., prof., doktor fiziko-matematicheskikh nauk (Leningrad)

Necessity of expressing the advantages of the MKSA more clearly. Comparative advantages of different unit system. Elektrichestvo no.3:88-89 Mr '60. (MIRA 13:6)
(Electric units)

S/026/60/000/012/007/009
A166/A027

AUTHOR: Sena, L.A., Professor (Leningrad)

TITLE: Electron and Ion Collisions

PERIODICAL: Priroda, 1960, No. 12, pp. 86 - 87

TEXT: The first Vsesoyuznaya konferentsiya po elektronnym i ionnym stolknoveniyam (All-Union Conference on Electron and Ion Collisions) was held in Riga in July 1959 to discuss the processes of the collision of electrons and ions with atoms and molecules of gas. The first group of papers was devoted to theoretical and experimental research into the probability of the excitation of atoms and molecules resulting from impact with an electron and its relation to the speed of the electron in question. L.A. Vaynshteyn and I.I. Sobel'man presented a paper on methods of calculating these processes with electronic computers. I.P. Bogdanova presented a paper on the results of experimental research into excitation, carried out in the laboratory of S.E. Frish, Corresponding Member of the AN SSSR (AS USSR), where an original method was used of measuring the probability of the excitation of atoms by low-speed electrons. To do this, Bogdanova made use of electric field braking of a beam of electrons accelerated to a compara-

Card 1/2

tively high speed. Given the speed of the electrons at each point in the beam, the probability of the excitation of atoms by electrons moving at various speeds can be determined by measuring the radiation issuing at any point in the beam. The second group of papers covered research into various collisions of heavy particles. N.F. Fedorenko, in a comparative study, showed that O.B. Firsov's approximate formula for determining the general dependence of the probability of ionization from the speed of the ions agreed satisfactorily with the results of measurements. Those papers dealing with the results of research into overcharging in alkali metal vapors showed a sensible divergence in findings but nonetheless confirm the conclusions from the theory, both as concerns the laws and the values measured. In one such work D.V. Chkuaseli, U.D. Nikoleishvili and A.I. Guliamashvili used methods which enabled them both to make measurements and also take an impression of the trajectories of the beams of ions and fast atoms. Working at the Khar'kovskiy fiziko-tekhnicheskiy institut (Khar'kov Physico-Technical Institute), Ya.M. Fogel' has directed research into collisions which lead to the formation and increase of negative ions.

S/048/60/024/008/001/017
B012/B067

AUTHORS: Sena, L. A., Drukarev, G. F.

TITLE: First All-Union Conference on Electron- and Ion Collisions

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 8, pp. 941-942

TEXT: From June 26 to July 3, 1959 the First All-Union Conference on Electron and Ion Collisions which had been organized by the Akademiya nauk Latviyskoy SSR (Academy of Sciences of the Latviyskaya SSR) took place in Riga. It was attended by representatives of scientific research institutes, schools of higher learning, and works in Moscow, Leningrad, Kiyev, Khar'kov, Tomsk, Riga, and other towns of the USSR. The main subjects of discussion were the inelastic collisions between electrons, atoms and molecules as well as processes taking place in heavy-particle collisions. L. A. Vaynshteyn opened the Conference with a lecture "General Theory of the Collisions of Electrons With Atoms" (see article by L. A. Vaynshteyn and I. I. Sobel'man on pp. 943-945 of the present periodical). - R. Ya. Damburg and V. Ya. Kravchenko spoke about "Estimation of the Effective Scattering Cross Sections

First All-Union Conference on Electron- and Ion Collisions

S/048/60/024/008/001/017
B012/B067

Yu. F. Bydin and A. M. Bukhteyev "Ionization of Fast Sodium-, Potassium-, Rubidium-, and Cesium Atoms in Collisions With Hydrogen-, Deuterium-, Nitrogen-, and Oxygen Molecules", L. G. Filippenko and I. P. Flaks "Scattering of Multiply Ionized Ions Accompanied by Electron Capture", I. P. Flaks and L. G. Filippenko "Ionization of Inert Gases by Doubly and Triply Charged Ions", V. V. Afrosimov, R. N. Il'in, and Ye. S. Solov'yev "Ionization of Argon Under Formation of Multiply Charged Ions". - N. V. Fedorenko and V. A. Belyayev spoke about "Maximum Cross Section of a Nonresonance Single Electron Charge Exchange", A. M. Bukhteyev and Yu. F. Bydin on "Resonance Charge Exchange of Ions and Atoms of the Alkali Metals", D. V. Chkuaseli, U. D. Nikoleyshvili, and A. I. Guldamishvili on "Resonance Charge Exchange of Positive Ions of the Alkali Metals", R. M. Kushnir and I. M. Buchma on "Further Studies of Resonance Charge Exchange of Positive Cesium Ions", V. L. Tal'roze on "Elementary Processes in Collisions Between Slow Ions and Molecules". The following lectures dealt with the investigations conducted at the Khar'kovskiy fiziko-tekhnicheskiy institut (Khar'kov Physico-technical Institute): Ya. M. Fogel' "Ionization in Collisions Between Ions and Atoms". - Ya. M. Fogel', V. A. Ankudinov, and D. V. Pilipenko "Electron

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S/057/60/030/008/013/019
B019/B060

AUTHORS: Ivanchenko, V. A., Sena, L. A.

TITLE: An Investigation of the Potential Distribution in a Space Charge Layer of Positive Ions

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 8, pp. 964-970

TEXT: A report is made here of a method of measuring the potential distribution of a space charge of positive ions. This method is based on an analysis of the energy of ions passing through the layer. In the introduction the authors refer, among other things, to papers by V. I. Drozdov (Ref. 2) and Yu. M. Kagan, V. I. Perel' (Ref. 3). The measurements were made on a layer placed between a negative electrode and a plasma discharge in Hg vapor. After a short discussion of the motion mechanism of ions in the layer, formula (1) is supplied for the ion flux. Errors and restrictions of this method are discussed, and the experimental arrangement is described (Figs. 1, 3). Fig. 5 is a graph illustrating potential distributions for different electrode voltages. Fig. 8 shows a comparison between

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SENA, L.A.

Statistical characteristics of arcing back. Zhur. tekh. fiz. 31 no.11:1368-1373 N '61. (MIRA 14:11)

1. Vyssheye voyenno-morskoye inzhenernoye ordena Lenina uchilishche imeni Dzerzhinskogo.
(Breakdown, Electric)

SENA, L.A., doktor fiziko-matematicheskikh nauk (Leningrad)

Concerning the unit of inductance and mutual inductance in the centimeter-gram-second system. Elektrichestvo no.9:94 S '62. (MIRA 15:9)
(Electric units) (Electric standards)

SENA, L.A.; FRIDLYAND, R.M.

Conditions leading to the origination of inverse firing due to mercury drops. Izv.NIIPT no.9:37-45 '62. (MIRA 15:12)
(Mercury-arc rectifiers)

L 13344-63 EWT(l)/EWG(k)/BDS/EEC(b)-2/ES(w)-2 AFFTC/ASD/ESD-3/AFWL/SSD
Pz-4/Pi-4/Po-4/Pab-4 AT/IJP(C)

ACCESSION NR: AP3004484 S/0048/63/027/008/0994/0995 89 85

AUTHOR: Sena, L. A.

TITLE: Second All-Union Conference on the Physics of Electron and Atom Collisions [Uzhgorod, 2—9 October 1962]

SOURCE: AN SSSR. Izvestiya, ser. fiz., v. 27, no. 8, 1963, 994-995

TOPIC TAGS: conference, electron collision, atom collision, collision physics

ABSTRACT: The II Vsesoyuznaya konferentsiya po fizike elektronny*kh i atomny*kh stolknoveniy (Second All-Union Conference on the Physics of Electron and Atoms Collisions), was held in Uzhgorod, 2—9 October 1962. The following reports were presented: "Theory of the charge-exchange process during atomic collisions," by Yu. N. Demkov; "Charge-exchange of multicharge ions," by I. P. Flaks; "Ionization due to atomic collisions," by N. V. Fedorenko; "Excitation of atoms and molecules due to electronic collisions," by I. P. Zapesochny*y; "Charge exchange and ionization during atomic collisions in the high-energy range," by V. S. Nikolayev; "Photoionization of gases and vapors by vacuum ultraviolet radiation," by Academician A. N. Terenin and F. I. Vilesov; "Effective cross sections of

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L 13344-63
ACCESSION NR: AP3004484 4

atomic collisions important in the theory of gaseous quantum generators," by I. I. Sobel'man; "Dissociation of molecules and ions during collisions of fast particles," by N. N. Tunitskiy; and "Corpuscular diagnostic of plasma," by V. V. Afrosimov.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 26Aug63 ENCL: 00

SUB CODE: PH NO REF SOV: 000 OTHER: 000

Card 2/2

VRASKIY, S.B.; SENA, L.A., prof., red.; GAL'CHINSKAYA, V.V., tekhn. red.

[Theory of oscillations] Uchenie o kolebaniiakh; uchebnoe posobie dlia studentov zaochnogo i osnovnogo fakul'tetov. Pod red. L.A.Sena. Leningrad, Leningr. elektrotekhn. in-t sviazi, 1963. 94 p. (MIRA 17:1)

SENA, L.A.; PANOV, I.P.; FRUMKIND, R.M.

Study of the quenching of the pilot arc of a high-voltage mercury-arc rectifier. Inv. NIIPT no.1:39-59 '57. (MIRA 18:9)

SENA, L.A.; FRIDLYAND, R.M.

Development of inverse firing in mercury rectifiers with anodes from different metals. Izv. NIIPT no.2:22-31 '57. (MIRA 18:9)

SENA, L.A.

Quenching of a cathode spot by residual plasma. Izv. NIIPT no.2:32-40 '57. (MIRA 18:9)

ACC NR: AP6029743 SOURCE CODE: UR/0053/66/089/004/0824/0729

AUTHOR: Drukarev, G. F.; Sena, L. A.

ORG: none

TITLE: Third all-union conference on physics of electron and atom collisions

SOURCE: Uspekhi fizicheskikh nauk, v. 89, no. 4, 1966, 724-729

TOPIC TAGS: physics conference, electronic collision, particle collision, heavy particle, particle scatter, ionization, helium plasma, gas discharge, luminescence spectrum

ABSTRACT:

The number of conferences devoted to the field of physics of electronic and atomic collisions reflects the increased interest in this field of science. To date, four international and three All-Union (Soviet) conferences dealing with this subject have been held. The most recent was the Third All-Union Conference on Electronic and Atomic Collisions held in Kharkov on 21—28 June 1965. Three hundred delegates heard 119 reports presented by the participants.

Card 1/19 UDC: 539.18

ACC NR: AP6029743

The Conference was opened by a lecture by V. V. Afrosimov, Yu. S. Gordeyev, M. N. Panov, and N. V. Fedorenko from the Leningrad Physical and Technical Institute (LFTI), entitled "Ionization and scattering with characteristic energy losses in atomic collisions." They discussed the results of experiments which have shown that ionization processes as a result of collisions of multielectronic systems at energies of the order of dozens of kev are always accompanied by characteristic energy losses. According to M. Ya. Amus'ya this phenomenon can be attributed to collective oscillations of electrons in electronic shells. The report and the theoretical interpretation of the effect aroused a great deal of discussion and were discussed at a special symposium devoted to this phenomenon.

The experimental investigations presented at the Conference dealt with a wide range of problems concerning the types of interaction, energy ranges, and the types of interacting particles. The basic results of most of these studies were variations of the effective cross sections with particle velocities.

A considerable number of reports dealt with collisions of heavy particles mostly at energies ranging from approximately 10 to several

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ACC NR: AP6029743

of helium, neon, argon, and molecular hydrogen atoms. The experiments have shown that in the adiabatic range, the experimentally determined effective cross sections differ from the theoretical values.

V. A. Gusev, D. V. Pilipenko, and Ya. M. Fogel' (FTI AN UkrSSR) have measured the cross section for the electron loss by negative hydrogen ions in collision with O_2, NO, and CO. For collision of H^- with CO, the dependence of the cross section on the velocity shows a certain structure which the authors attributed to the transfer of the electron to the CO molecule. The newly formed negative ion may then dissociate into charged or neutral fragments and an electron. The same authors also measured the cross section for the formation of negative ions. Yu. F. Bydin (LFTI) also dealt with the loss of electrons in collisions of alkali metal ions with the atoms of inert gases. In these experiments the energy of ions varied between 600 and 3000 ev. The results obtained were analyzed from the point of view of the theory of interaction of negative ions with atoms developed by O. B. Firsov and B. M. Smirnov.

In the research work of R. N. Il'in, V. A. Oparin, Ye. S.

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multicharged ions, and measurements of cross sections for losses and capture of electrons by positive and negative ions.

Development of research on low-temperature plasma requires the knowledge of cross sections for various processes at low energies down to tens of ev, which unfortunately, presents considerable difficulties to experimenters. Very few papers dealing with this low range of energies can be found in the literature. Only two reports at the Conference covered this low range, and both of these dealt with the measurements of resonance charge exchange cross-sections. In one lecture, presented by B. M. Palyukh and L. S. Savchin (Lvov University), the cross section for charge exchange of potassium and cesium at energies ranging from 100 to 3 ev was determined by the "classical" retarded field method. In the second work, V. A. Belyayev, V. G. Brezhnev, and Ye. M. Yerastov proposed an original method for measuring the cross sections based on the fact that the interacting particle beams move together with almost identical velocities.

In addition to measuring the cross sections for interactions of heavy particles, some researchers used these interactions as a means of investigation. One of the papers described a method developed for investigation of hot plasma by fast particle beams. Using the

resonance charge exchange of hydrogen atoms on protons, V. V. Afrosimov, B. A. Ivanov, A. I. Kislyakov, and M. P. Petrov (LFTI) have measured the concentration of protons in the "Alpha" unit. L. I. Krupnik and N. G. Shulika (FTI AN UkrSSR) have analyzed the possibility of developing methods for determining the parameters of hydrogen and helium plasmas having various densities and degrees of ionization. A. B. Kamnev and V. B. Leonas, working along the same line, used small-angle scattering in atomic collision to determine the potential functions of interaction between all combinations of inert gas atoms.

Among the experimental works, the largest group of papers presented consisted of investigations of collisions (primarily inelastic collisions) of electrons with atoms and molecules. The report presented by the members of the Uzhgorod University (I. P. Zaposochnyy, L. P. Shimon, O. B. Shpenik, and others) described the results of measurements of excitation functions for alkali metal atoms, metals of the second group in the periodic table, inert gases, and nitrogen molecules. The nature of the complex structure of

excitation functions aroused considerable discussion. While a number of peaks can be easily explained by cascade transitions, in other cases the origin of many peaks is still unexplained. According to Y. P. Bogdanova (Leningrad State University), the additional peaks in the excitation function curve for helium near the excitation threshold can be attributed to impurities.

Ionization of atoms by electron impact was the subject of investigations by G. M. Beylina, S. I. Pavlov, and V. I. Rakhovskiy (All-Union Electrotechnical Institute imeni V. I. Lenin). Using the intersecting beam method they measured the ionization cross sections of certain heavy atoms (silver, copper, lead).

A number of reports was devoted to the investigation of various processes occurring in collisions of electrons and ions with molecules accompanied by ionization, dissociation, and the appearance of excited electronic and vibrational states. In a review paper entitled "Collisions of electrons and ions with molecules," N. N. Tunitskiy considered the regularities and the collision mechanism for multiply charged ions with atoms and molecules. The author presented data on the effect of electronic and vibrational excitation on ion-molecule

reactions. A. A. Perov, S. Ye. Kupriyanov, and N. N. Tunitskiy (Physical and Chemical Institute imeni L. Ya. Karpov), investigating the dissociation of molecular ions of hydrogen on neon, have shown that the cross section for dissociation depends on how the ions are formed. In ionization of hydrogen-containing molecules, the cross section is considerably larger than in ionization of hydrogen molecules. The authors attribute this effect to the difference in the distribution of ions obtained in various vibrational states.

G. Ye. Spezhakova, M. V. Tikhomirov, and N. N. Tunitskiy reported on the experimental investigation of ion-molecule reactions of the molecular hydrogen ion with a hydrogen molecule and with a helium atom at various energies of ionizing electrons. These results are in good agreement with the theoretical considerations based on the statistical model proposed by O. B. Firsov. The two reports by S. Ye. Kupriyanov: "Longlasting excitation states of ions and molecules and their role in collision processes" and "Formation of hydride ions of noble gases and H_3^+ ions in collisions of excited and non-excited ions and molecules," as well as a report by V. Yu. Orlov: "Multiply charged ions in mass-spectra of some silicoorganic compounds." also dealt with the same subject.

APPROVED FOR RELEASE: 08/09/2001 CIA-RDP86-00513R001547920011-1"

The Conference heard a number of papers in which the data on basic processes in plasma were obtained not through the study of single collisions and measurement of the corresponding cross sections, but on the basis of analysis of properties and behavior of plasma. Although the characteristics determined in such a way appear, as a rule, to be spread over all the energies, the difficulty of direct measurements at low energies makes such investigations a basic technique for obtaining information on collision processes in low-temperature plasma.

Investigations of low-temperature plasma were conducted by various methods: optical, electrical, microwave, or sometimes by using more than one of these techniques. The results of these investigations make it possible to evaluate the relative importance of individual elementary processes in plasma.

M. A. Yel'yashevich and coworkers (Institute of Physics, Academy of Sciences Belorussian SSR) have analyzed the conditions under which forbidden transitions can take place in plasma under the influence of intermolecular electric fields. The intensity of these transitions was used in determining the concentration of charged

particles in the direct-current arc and in the pulsed discharge plasma stream. T. V. Bazhenova and Yu. S. Lobastov, using the method of microwave absorption, have investigated the plasma of gas heated by shock waves to temperatures of 2000—7000K. Using the experimental values of the electron concentration and the effective number of collisions of electrons with atoms, the author determined the cross sections for collisions in nitrogen, oxygen, CO, CO_2, and argon averaged over the velocity distribution. By measuring the optical and electrical characteristics of the discharge in mixtures of N_2 and Ar, CO and Ar, N_2 and CO, and N_2 and He, L. A. Cherenko, V. V. Kokhonenko, and N. A. Prileznayeva (Tomsk University), have determined the cross sections for collisions of the second kind involving collisions of excited atoms and molecules. Using the electrical and optical methods E. G. Gnevysheva, L. A. Luizova, V. S. Krivchenkova, and A. D. Khakhayeva have investigated the mechanism for the excitation of helium and neon in the positive discharge column.

Basic processes in a helium discharge were analyzed in the works of I. Ya. Fugol' and P. L. Pakhomov, "Investigation of the process of pair collisions of metastable atoms in helium-plasma

with physical processes of the upper atmosphere. A very thorough review paper was delivered by G. S. Ivanov-Kholodnyy and A. D. Danilov entitled "Chemistry of the ionosphere," in which it was shown how the results of laboratory experiments on the basic processes and the research data obtained on the ionosphere should supplement one another. This is even more necessary in view of the fact that the laboratory data on the values of constants of basic processes are often unreliable.

In investigating the luminescence spectra of N_2, O_2, CO, CO_2, and NO molecules and of air, and in comparing these spectra with the emission spectra of the same gases excited by slow electrons and protons with energies of 37 kev, as well as with spectra of the same gases excited by slow electrons and protons with energies of 37 kev, as well as with spectra of auroras, Z. G. Koval', V. T. Koppe, and Ya. M. Fogel' (FTI AN UkrSSR) came to a preliminary conclusion that not only the fast electrons but also the slow electrons play an important role in the excitation of auroras. Based on the same analysis, the authors concluded that oxygen is found primarily in the dissociated state in the atmospheric layers in which auroras occur.

ACC NR: AP6029743

The largest number of papers, theoretical as well as experimental, was devoted to collisions of electrons with atoms. Research in this field is being conducted mainly at the Leningrad State University, the Institute of Physics of the Academy of Sciences USSR, and Institute of Physics of the Latvian Academy of Sciences. Computers were used extensively in most of these works, making it possible to include a number of previously neglected factors in the computations and also to broaden the scope of the research. Some of the papers presented and the results obtained are listed below. M. Gaylitis used the variational principle in computing the triplet and singlet phases of scattering of electrons by hydrogen atoms at the total angular momentum L = 0, 1, 2. The computation indicated the presence of prethreshold resonances. I. Vinkalis calculated partial cross sections for ionization of hydrogen atoms by electrons for angular momentum L 0 through 6, taking exchange, polarization, and other factors into account. E. Karule and R. Peterkop calculated the cross sections for scattering of electrons by atoms of alkali metals at energies below the excitation threshold and for excitation at energies slightly above

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with I. I. Sobel'man to calculate cross sections for a number of transitions in atoms of alkali metals for levels above the resonance level. It was established that for the transitions $n_0S \rightarrow (n_0 + 1)P$ (where n_0 is the principal quantum number of the ground level), the cross section for a transition through an intermediate layer was considerably larger than the cross section for a direct transition. L. A. Vaynshteyn and A. V. Vinogradov, in "Ionization of an atom with simultaneous excitation of an ion in electron impact," consider processes leading to a change in state of more than one electron. Computations made in the second Born approximation have shown that the cross section for the Ar $(3p^6)^e$ process is of the same order of magnitude as the cross section for the usual ionization. I. L. Beigman, in "Cross section for ionization of ions by electron impact in the Born-Coulomb approximation," has computed cross sections for ionization of some levels of excited atoms of carbon and helium. M. A. Mazing and I. I. Sobel'man have demonstrated the possibility of estimating an effective cross section for inelastic interactions of electrons with excited atoms by measuring the width and shifts of spectral lines in plasma. Using experimental data, they determined effective cross sections for a number of transitions between the excited levels of He, Ne, and Ar^{++}.

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ACC NR: AP6029743

A considerable number of theoretical papers was devoted to collisions of heavy particles. Some of these dealt with the investigation of resonance and nonresonance charge exchange. G. V. Dubrovskiy and V. D. Ob'yedkov (Leningrad State University) have analyzed endothermic reactions of the type $A^+(^1S) + B(^1S) \rightarrow A(^2S) + B^+(^2P) - \Delta E$ in the energy range of 1—2 kev. A particular characteristic of this process was a strong polarizational interaction of particles in the final state. On the basis of results obtained, the authors have computed the cross section for the charge exchange of alkali metal ions with the atoms of inert gases. Ye. Ye. Nikitin (Institute of Chemical Physics) has developed a theory of nonresonance charge exchange for multiply charged ions, which takes into account the Coulomb interaction. The solution was obtained in the two-level approximation using the exact asymptotic form of electronic wave functions. The results make it possible to clarify the limits of applicability of various theories of nonresonance charge exchange. Yu. Ye. Murakhver (Leningrad State University) computed the angular distribution of resonance charge exchange of helium atoms and ions. Calculations of differences in the trajectory for the symmetric and the antisymmetric states of the quasi-molecules performed in the quasi-classical approximation lead to a smoothing of oscillations.

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ACC NR: AT0029743

Yu. N. Demkov developed a theory of electron stripping during a slow collision of a negative ion with an atom when, as the nuclei approach each other, the bound state merges with the continuous spectrum.

Papers on the calculation of various processes of ionization and excitation in atomic and atom-molecular collisions were presented. A. V. Vinogradov and I. A. Poluektov (Physics Institute of the Academy of Sciences) presented a paper on "Excitation of atoms by neutral particles," in which they discussed calculations of cross sections for excitation of a hydrogen atom in a collision with a nitrogen molecule and a hydrogen atom. A. D. Derbeneva (Academy of Sciences TadzhikSSR) delivered a paper entitled "Cross sections for ionization and cross sections for diffusion of Fe, Ca, Si, and Mg with 0 and N at 0.4—1.5 kev." Yu. Sazhinev and Yu. V. Bulgakov presented a paper on "Computation of the cross section for dissociation of the H_2^+ ion in collision with a hydrogen atom."

Quite a few papers also dealt with general theoretical problems and new methods of computation. [FSB: v. 2, no. 11]

SUB CODE: 20 / SUBM DATE: none

Card 19/19

KOTLYAROVA, Kh.S.; RODSHTEYN, O.A.; GUR'YEVA, Ye.P.; SENA, N.D.; GALKO, N.V.

Epidemiological characteristics of poliomyelitis in Lenengrad during 1957. Trudy Len.inst.epid.i mikrobiol. 17:156-168 '58. (MIRA 16:2)

1. Iz Leningradskogo instituta epidemiologii, mikrobiologii i gigiyeny imeni Pastera (dir. M.Ya. Nikitin).
(LENINGRAD—POLIOMYELITIS—CASES, CLINICAL REPORTS, STATISTICS)

KLYACHKO, N.S.; GUSARSKAYA, I.L.; MASLENNIKOVA, L.K.; SENA, N.L.; TSIRLINA, S.S.

Specific prophylaxis against mumps. Report No.4: Epidemiological efficacy of living attenuated mumps vaccine inoculated intradermally in children [with summary in English]. Vop.virus. 3 no.1:28-33 Ja-F '58. (MIRA 11:4)

1. Virusologicheskaya laboratoriya Instituta imeni Pastera i Nauchno-issledovatel'skiy pediatricheskiy institut Ministerstva zdravookhraneniya RSFSR, Leningrad.
(MUMPS, prevention & control
living attenuated mumps vaccine, efficacy of intradermal inject. in children (Rus)

SENA, Z.

Thermodynamic functions of dimethyl ether. Z. Sena (Výzkumný ústav org. synthes, Pardubice-Rybitví, Czech.). *Chem. Listy* 49, 1669–70(1955).—From published data the thermodynamic functions C_p°, $(H^\circ - H_0^\circ)/T$, S°, $-(G^\circ - H_0^\circ)/T$, ΔH_f°, ΔG_f°, and log K_f of Me_2O in the temp. range 298.16 – 1000°K. were calcd. by the rigid-rotator harmonic-oscillator approximation method. The heat capacity is expressed by the equation $C_p = 3.693 + 44.89 \times 10^{-3}T - 14.57 \times 10^{-6}T^2$ cal./mol. with a max. error ±0.45%.

E. Erdös

5(4) SOV/69-21-4-17/22

AUTHOR: Senakhov, A.V. and Sadov, F.I.

TITLE: Investigation Into the Structure-Mechanical and Rheological Properties of Aqueous Solutions of Untreated Thickening Agents

PERIODICAL: Kolloidnyy zhurnal, 1959, Vol XXI, Nr 4, pp 476-484 (USSR)

ABSTRACT: This is a study of the structuro-mechanical and rheological properties of the solutions of a number of thickening agents used in the textile industry for the thickening of printing dyes. On the basis of the determined indices of the structuro-mechanical properties (graphs 1-15 and table) the authors have designed corresponding models (diagram) and rheological curves (graphs 7 a and b), which illustrate the obtained results. The determination of the indices of the structuro-mechanical properties was carried out on the basis of a system of characteristics of elasto-plastic properties proposed by P.A. Rebinder [reference 4]. The indices included in this system are E_1 and E_2 (moduli of eleasticity), η_1 and η_2 (viscosity) and P_k (elasticity maximum). The experiments were performed with the

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Investigation Into the Structure-Mechanical and Rheological Properties of Aqueous Solutions of Untreated Thickening Agents

aid of the plate method (metod plastinki) and the torsion device of the Shvedov type [references 6 and 16]. In contrast to the other investigated thickening agents (tragacanth, dextrin a.o.) plastic deformations of gels of untreated starch could be obtained only after irreversible destruction of their internal structure (graph 1). Untreated starch, therefore, cannot be used as a thickening agent. The experiments have further shown that thixotropy is a basic criterion for the qualification of the considered systems as thickening agents. It was observed as a general rule that each thickening agent has its optimum concentration, which corresponds to a well-defined degree of structurization and a maximum viscosity of the system. All structuro-mechanical indices of the investigated solutions increase with growing concentration according to the parabolic equation [reference 13 and 14]. For each of the thickening agents the index of n (degree of structurization,

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i.e. the relative quantity of elementary particles in the system capable of contacting and forming a structural network) in the concentration formula $X=X'c_2^n$ (X is one of the structuro-mechanical indices, X' the corresponding coefficient of proportionality and c_2 the concentration of the tickening agent in the gel) is common for the different X indices. From this it can be seen that the correlations between structuro-mechanical indices are not subject to a change in concentration and appear as characteristic magnitudes for each thickening agent. The "degree of structurization" is of basic importance for the comparison of solutions of the same or different thickening agents. On the whole, the investigation has shown that thickening agents, which are suitable for practical purposes, have a common structuro-mechanical model and related rheological properties. The difference consists in the values of the indices. There

SC7/69-21-4-17/22

Investigation Into the Structure-Mechanical and Rheological Properties of Aqueous Solutions of Untreated Thickening Agents

are 4 graphs, 1 diagram, 1 table and 19 references, 9 of which are Soviet, 6 English, 3 German and 1 French.

ASSOCIATION: Moskovskiy tekstil' nyy institut (Moscow Textile Institute)

SUBMITTED: 24 December 1957

Card 4/4

VIL'DT, Ye.O.; SADOV, F.I.; SENAKHOVA, R.V.; SAFRONOVA, L.I.

Evaluating the degree of dye take-up by favrics in printing and dyeing. Izv. vys. ucheb. zav.; tekh. teks. prom. no.6: 76-80 '65. (MIRA 19:1)

1. Moskovskiy tekstil'nyy institut. Submitted April 3, 1965.

SENATOR, M.; BABENDIKH, Kh. [Babendich, H.]; OTLEVSKI, A. [Otlewski, A.]; BERLYANT, I.Ya., red.; ZAYTSEVA, L.A., tekhn. red.

[Artistic mending; clothing repair] Khudozhestvennaia shtopka; remont odezhdy. Moskva, Gos. izd-vo mestnoi promyshl. i khudozh. promyslov RSFSR, 1961. 81 p. (MIRA 14:9)
(Clothing and dress--Repairing)

ACC NR: AT6030941 (A) SOURCE CODE: UR/0000/66/000/000/0122/0132

AUTHORS: Ignat'yeva, V. S. (Candidate of technical sciences); Rubinshteyn, V. D.; Senatorov, A. P.

ORG: none

TITLE: Stresses arising during the welding of tempered steels as a consequence of drawing the zone near the seam

SOURCE: Moscow. Vyssheye tekhnicheskoye uchilishche. Prochnost' svarnykh konstruktsiy (Strength of welded structures). Moscow, Izd-vo Mashinostroyeniye, 1966, 122-132

TOPIC TAGS: welding, welding technology, butt welding, stress analysis

ABSTRACT: An effort is made to explain the variation of internal stresses and strains in the welded zone of tempered steels with the dimensions of the welded object and the type of weld. The study is limited to the special case of one-pass butt welds. As a first approximation, the completion of the weld is assumed to be instantaneous and structural variations in the drawing zone occur instantaneously. Under these assumptions stress components may be identified by application of the methods given by N. N. Prokhorov and V. S. Ignat'yeva (Resheniye zadachi o fazovykh napryazheniyakh pri svarke zakalivayushchikhsya staley kak chastnyy sluchay resheniya temperaturnoy zadachi teorii uprugosti. Sbornik trudov MVTU im. Baumana. Svarka tsvetnykh splavov

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SENATOROV, K.Ya.; BERESTOVSKIY, G.N.

Analysis of processes in a transistor blocking oscillator.
Radiotekh. i elektron. 1 no.5:654-669 My '56. (MLRA 9:12)

1. Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta.
(Oscillators, Transistor)

SENATOROV, K. Ya.

PHASE I BOOK EXPLOITATION 548

Akademiya nauk SSSR. Tsentral'naya nauchno-issledovatel'skaya laboratoriya elektricheskoy obrabotki materialov

Elektroiskrovaya obrabotka metallov (Electrospark Machining of Metals) Moscow, Izd-vo AN SSSR, 1957. 225 p. (Series: Its: Trudy, vyp. 1) 5,000 copies printed.

Resp. Ed.: Lazarenko, B. R.; Ed. of Publishing House: Moyzhes, S. M.; Tech. Ed.: Astaf'yeva, G. A.

PURPOSE: This book is intended for scientists and engineers working in the field of electrospark machining of metals and for metallurgists and machine builders.

COVERAGE: This collection of technical papers deals with electrospark machining of metals. It presents information on developments in this field in the Soviet Union and abroad. A detailed discussion is given of the results of investigations of physical phenomena of electrospark process, the methods of measuring spark-gap power, metallographic examination of machined surfaces, and the design and development of new types of electrospark installations. For the abstract of each paper see the Table of Contents. There are 126 references of which 91 are Soviet, 19 English, 10 German, and 6 French.

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tric. The experimental data and the mathematical expressions of the relations between the rate of metal erosion and the electrode gap energy are given and the effects of electrode polarity and pulse duration on the rate of erosion are investigated. Various existing theories developed in order to explain the nature of spark erosion are reviewed and their reliability in the light of available experimental data are discussed. The article contains several graphs of experimental data. There are 42 references, 33 of which are Soviet, 5 English, 3 German, and 1 French.

Lazarenko, N. I. Change in the Initial Properties of the Cathode Surface Under the Action of Electric Spark Pulses Flowing in Gaseous Media 70

In this article the author investigates changes in the properties of a negative electrode resulting from an electrical discharge when electrodes are immersed in a gaseous dialectric, and describes some practical applications of electrical erosion. Both electric spark and electric arc discharges were investigated. The author concludes that any type of electrical discharge is followed by erosion of electrodes and that for each type of electrical discharge there exists a corresponding polarity of erosion. There are 6 references, 5 of which are Soviet, and 1 German.

Mogilevskiy, I. Z., and Chepovaya, S. A. Metallographic Investigation of the Surface Layer of Steel Following Electrospark Machining 95

This article deals with the techniques of investigating the structure and

direct (graphical-analytical) method 3) Method based on the use of electron-tube equipment. The procedure of each method and its advantages and disadvantages are presented in detail. It is stated that the calorimetric method is a direct method based on measuring energy dissipated in the form of heat but as it requires the construction of a special electrospark installation with calorimeter, it is only feasible in laboratory conditions. Also this method does not make it possible to measure energy lost due to chemical transformations and the method gives only average results. The graphical-analytical method includes a method of graphical integration in the coordinates of "u" and "i" (where u=voltage applied, and i=gap current). If the relationship between "u" and "i" is available as a function of t (t=time) the problem reduces to the solution of the following integral:

$$W = \frac{N}{T} \int u(t)i(t)\,dt$$

(where W= average power; t_u = pulse duration; and N = number of pulses). It is concluded that this method makes it possible to determine the energy and power in the spark gap with a high degree of accuracy, but requires special equipment to obtain the oscillograms of the relations between u(t) and i(t) or u(i) and that the solution of the integral is in many cases a time-consuming operation. The third method which is based on the use of electron-tube equipment is said to be an exact method

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A "Characterograph" for Semiconductor Triodes.

give the required characteristic. A voltage proportional to the linearly changing current is applied to the X amplifier of a CRT, and a voltage from the appropriate semiconductor electrode is applied to the Y amplifier. Calibration is obtained by measuring the voltages on the electrodes and the current through the triode. The circuit is given in Fig.1 and the waveforms in Fig.2. The circuit consists of the following: multivibrator ($Л_1$ - Fig.2a); sawtooth generator ($Л_{16}$ - Fig.2д); step voltage generator ($Л_2$, $Л_3$, $Л_4$, $Л_5$ - Fig.2в); cathode follower, supplying the emitter current ($Л_5$ - Fig.2ъ); cathode follower, used to draw the collector current ($Л_{15}$ - Fig.2e). Diodes $1/2Л_{12}$, $Л_{14}$ establish the DC components and diodes $Л_{13}$, $Л_{10}$, $1/2Л_{11}$, $Д_1$ together with the meter $П_4$ measure the linearly changing current. Meter $П_2$ measures the step current. The

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A "Characterograph" for Semiconductor Triodes.

characterograph is supplied by the rectifier BYC-1, and UO-4 together with photographic recording is used for displaying the characteristic curves. Figs.3 and 4 show oscillograms of the characteristics of point and plane semi-conductor triodes; Fig.5 shows the collector characteristics for a plane triode in the region of saturation. There are 5 illustrations and no references.

ASSOCIATION: Department of Physics of the Moscow State University imeni M. V. Lomonosov (Fizicheskiy fakul'tet MGU im. M. V. Lomonosova)

SUBMITTED: January 28, 1956.

AVAILABLE: Library of Congress.

Card 3/3 1. Semiconductors-Analysis 2. Triodes-Analysis 3. Instrumentation

120-3-24/40

AUTHORS: Sonntorov, K.M. and Borisovskiy, G.N.

TITLE: A Pulsed "Characterograph" for Plane (Junction) Semiconductor Triodes (Impul'snyy kharakteriograf dlya ploskostnykh poluprovodnikovykh triodov)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, Nr 3, pp.84-87 and 2 plates (USSR)

ABSTRACT: To apply theoretical calculations to pulsed circuits, using semi-conductor triodes, it is necessary to obtain the volt-amp characteristic curves under conditions approximating to the working regime of the circuit. The deciding factor which determines the choice of the families of curves is the stability of the value of the parameter with change of the independent variable. Experiment shows that the families most easily obtained are $U_k = f_1(i_k, i_\sigma = \text{const})$, and $U_\sigma = f_2(i_k, i_\sigma = \text{const})$. (U - voltage, i - current, k - collector, σ - base). Fig.1 shows such curves taken with the described characterograph. The collector current in the characterograph is a falling or growing sawtooth. A rectangular current pulse is applied

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A Pulsed "Characterograph" for Plane (Junction) Semiconductor Triodes.

to the base circuit. The duration of the pulses can be varied from 20-100 μsec. The characteristic is displayed on a CRT, the beam being deflected by a voltage proportional to the collector current. The block diagram is given in Fig.2 and the circuit in Fig.3. The rectangular and sawtooth current pulses are obtained from corresponding voltage pulses by the power amplifiers ($Л_1$ and $Л_2$) in the cathodes of which are connected the primary windings of TU_1 and TU_2. The secondary windings are connected through variable resistors to the semi-conductor electrodes. The transformers are necessary to permit change of the polarity of the pulses to the input circuits of the semiconductor triodes when the circuit connections (common base or common emitter) are changed by switch $П_1$. Smooth change of the pulses from zero to maximum amplitude is obtained by varying the bias applied to the grids of the amplifiers. The positive rectangular pulses are produced by a triggered vibrator ($Л_6$). The positive sawtooth pulses are produced by two generators: one generator giving an

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A Pulsed "Characterograph" for Plane (Junction) Semiconductor Triodes.

increasing sawtooth voltage ($Л_{10}$, $Л_{11}$) and the other a falling voltage ($Л_9$, $Л_{10}$). These generators are controlled by negative pulses from the multivibrator. For a stable picture, the driving blocking oscillator is synchronized from the 50 c/s mains. $Л_3$ is the bright-up valve. The sweep voltage is taken from R_9 in the collector circuit. Switch $П_1$ is used to change the triode connections and the polarity of the rectangular pulses. The cathode follower $Л_7$ in the Y amplifier circuit reduces the effects of stray capacity. Details of the transformers TU_1 and TU_2 which determine the minimum pulse duration are given. There are 3 illustrations and no references.

ASSOCIATION: Department of Physics of the Moscow State University imeni M. V. Lomonosov (Fizicheskiy fakul'tet MGU im. M.V. Lomonosova)

SUBMITTED: January 26, 1956.

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Card 3/3 1. Semiconductors-Characteristics 2. Triodes-Characteristics 3. Transformers

Transient Characteristics of Junction Transistors.

the transient response of the system is evaluated. This is given by Eq.(4) in which $A = \left(\frac{W_o}{L_6}\right)^2$. Eq.(4) is in the form of a rapidly converging series. A graph of Eq.(4) is shown in Fig.1, where it is plotted against ξ , which is the time normalised with respect to t_o , where t_o is given by Eq.(7). It is shown that the curve of Fig.1 can be satisfactorily approximated by an exponential which is delayed by a time t_o with respect to the origin.(see Eqs.9). These approximate equations can be used to derive an approximate expression for α as a function of frequency (see Eq.11). For a grounded emitter transistor amplifier the expression for the transfer function is given by:

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Transient Characteristics of Junction Transistors.

There are 8 figures and 9 references, of which 4 are Slavic.

ASSOCIATION: Physics Faculty of the Moscow State University im. M.V. Lomonosov (Fizicheskiy Fakul'tet Moskovskogo Gosudarstvennogo Universiteta im. M.V.Lomonosova)

SUBMITTED: February 25, 1957.

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Investigation of a Free-running Multivibrator employing Junction Transistors.

(2) a closed transistor can be represented as a series connection of the emitter and collector junctions, but during the calculations it is necessary to consider only the resistance of the collector junction r_{kc}, and (3) the changeover of a transistor from the nonconducting to the conducting state takes place when the potential of the base with respect to ground is zero. It is shown that the voltage at the base of the first transistor can be expressed by Eq.(1), from which the length of its pulse is given by:

$$T_1 = \frac{R_{б1} r_{кс1} C_1}{R_{б1} + r_{кс1}} \ln \frac{E_к}{E_к + V'_{б1}} \quad . \qquad (2)$$

Similarly, the duration of the pulse for the second transistor is given by:

Investigation of a Free-running Multivibrator Employing Junction Transistors.

in the form given by Eqs. (11), (12) and (13), and $\alpha_{\beta 0}$ is the mean current amplification factor for the transistor operating in the grounded-emitter circuit. In most cases Eq.(10) can be simplified (see Eq.(14)), and it is then possible to determine the rise time of the fast transient τ_{β}, which is given by Eq.(21). The above theory was supplemented by experiments carried out on a multivibrator employing several types of junction transistors in which the capacitances C_1 and C_2 were varied from 750-10 000 pF. Curves representing the amplitude of the base pulses as a function of the coupling capacitances are shown in Fig.5, dependence of the base pulses on the supply voltage at fixed coupling capacitances is illustrated by Fig.6 and the duration of the pulses as a function of the coupling capacitances is shown in Fig.7. Application of the above theoretical and experimental results to the design of practical circuits is briefly outlined. There are 7 figures, 7 references, of which 3 are Slavic.

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SENATOROV, K. YA.

109-9-4/15

AUTHORS: Senatorov, K. Ya. and Guzhov, V.P.

TITLE: Investigation of the Operation of a Transistor Blocking Oscillator. (K Issledovaniyu protsessov v bloking-generatore na poluprovodnikovom triode)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol.II, Nr 9, pp. 1119 - 1126 (USSR)

ABSTRACT: The oscillator considered (see Fig.1) consists of a p-n-i-p high frequency transistor, a crystal diode and employs the usual transformer plus a condenser and a resistance. The operation of the oscillator is split into two stages: (1) a low frequency process (the charge on the capacitor changes comparatively slowly) and (2) the generation of the pulse front (fast transient). For the slow process which determines the period of oscillation of the system, it is possible to represent the equivalent circuit of the oscillator as shown in Fig.2, in which $r_э$ is the reverse resistance of the diode (this is assumed to be much larger than the resistance of the emitter junction). It is assumed that the characteristic of the diode can be expressed by Eq.(1). For this case the period of the oscillator is approximately

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Investigation of the Operation of a Transistor Blocking Oscillator.

given by:

$$T_o = RC \ln\left(1 + \frac{U_{c0} + E_э}{R_{i_0}}\right) , \qquad (2)$$

where U_{c0} is the initial voltage at the condenser C. It is found experimentally that Eq.(2) gives values which are accurate to within several per cent. During the generation of the front edge of the pulse the equivalent circuit of the oscillator is that shown in Fig.8, where α as a function of the emitter current is given graphically in Fig.7. The system is now described by the differential equation given on p.1124, in which L_{pac} is the stray inductance of the transformer, $r_{вх}$ is the input resistance and r_K is the collector resistance. It was found that the solution of the above equation (plotted in Fig.9) gives rise times shorter than the experimental values. This is primarily due to the fact that the equation does not consider the reactances of the transistor. These can be taken into account by employ-

SENATOROV, K. Ya.

109-9-11/15

AUTHORS: Berestovskiy, G.N. and Senatorov, K.Ya.

TITLE: A Voltage Converter Employing High Power Transistors (Preobrazovatel' napryazheniya na moshchnykh poluprovodnikovykh triodakh)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol.II, Nr 9, pp.1178 - 1188 (USSR)

ABSTRACT: The converter employs two Soviet power transistors, type П3В, which are connected in a push-pull oscillator circuit (see Fig.2). The system consists of a triple transformer in which the supply source is connected to the collectors of the transistors and the base voltages are provided by two special identical windings; the load is connected across a secondary winding. During the operation of the converter the transistors are being successively opened or closed. While one of the transistors is being cut off, the voltage at the base of the second transistor changes its polarity and thus the transistor becomes conducting. The changeover process is comparatively rapid. After the changeover the currents in the system change comparatively slowly since the magnetising current in the transformer, j , increases rather slowly. At a certain value of j the increase in the current ceases and the system changes over to the second

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A Voltage Converter Employing High Power Transistors.

$$P_H = \frac{n^2E^2}{(n+1)^2R_H}$$, (11) where R_H is the load and n is the turns ratio of the collector and the base windings of the transformer. Output power, power losses and efficiency of the converter as a function of n are plotted in Fig.6. It is found that efficiencies as high as 90% are comparatively easily attainable. At the end of the slow process one of the transistors "enters" into the so-called active region (to the left of N - N line in Figs.3) and the system undergoes a change-over into the second state. For the analysis of the change-over it is assumed that the current amplification coefficient of a transistor $\alpha_э$ is constant and that the input impedance of the transistor is also a constant quantity. It is further assumed that the inertia effects in the transistors are of importance during this stage while the transformer magnetising current does not change and the transistor which is being opened has a negligible effect. An equivalent circuit of the system for the change-over is derived (see Fig.7) and the transient

A Voltage Converter Employing High Power Transistors.

converter may not oscillate if it feeds into a rectifier with a capacitive input filter. It is therefore necessary to use an input inductance followed by a capacitance. There are 10 figures, 3 of which are sets of oscillograms, and 5 references, of which 3 are Slavic.

ASSOCIATION: Physics Faculty of the Moscow State University im. M.V. Lomonosov (Fizicheskiy Fakul'tet Moskovskogo Gosudarstvennogo Universiteta im. M.V.Lomonosova).

SUBMITTED: February 25, 1957.

AVAILABLE: Library of Congress.

Card 5/5

SEMITOKOV, K. YA.

Yu. M. Az'yan, K. YA. SEMITOKOV: "Influence of peculiarities of transient characteristics on the operation of a circuit using semiconducting triodes." Scientific Session Devoted to "Radio Day", May 1958, Trudreservizdat, Moscow, 9 Sep. 58

It is shown that the kind of transient function depends substantially on the bias current of the emitter junction in the small value region. A physical analysis is given of this phenomenon; the conclusions of the research are verified by experiment.

SENATOROV, K. YA.

10 июня

(с 18 до 22 часов)

В. И. Самойленко

Тепловые режимы полупроводниковых приборов.

В. Н. Вертоградов

Исследование и расчет температурной зависимости параметров полупроводниковых триодов дрейфового типа

Ю. Р. Носов,
Б. Н. Хазанов

Осуществление температурной стабилизации усилителя напряжения на полупроводниковых триодах различных типов.

М. А. Абдюханов

О зависимости параметров сплавных полупроводниковых триодов от тока эмиттера.

В. П. Панаева

Шумы в полупроводниковых усилителях.

11 июня

(с 10 до 16 часов)

Г. Н. Берестовский

Статические характеристики и переходные процессы в полупроводниковом триоде при большом сигнале

Т. Н. Ястребцева,
В. Н. Курильчик

Исследование особенностей работы спусковой схемы на плоскостных полупроводниковых триодах при счетном запуске в зависимости от параметров триодов.

А. Ю. Гарламов

Расчет усилительного каскада на транзисторах

В. А. Кузьмин

О влиянии режима насыщения в полупроводниковых триодах на работу импульсных схем.

11 июня

(с 18 до 22 часов)

Ю. М. Азьмин,
К. Я. Сенаторов,
С. М. Чудинов

Об объемном заряде и электрическом поле в базовой области сплавного триода.

К. С. Ржевкин

Влияние модуляции толщины базы на характеристики сплавного триода

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORIE), Moscow, 8-12 June. 1959

9(4) PHASE I BOOK EXPLOITATION SOV/3233

Az'yan, Yu. M., G. N. Berestovskiy, L. N. Kaptsov, K. S. Rzhevkin, and K. Ya. Senatorov

Poluprovodnikovyye triody v regenerativnykh skhemakh (Semiconductor Triodes In Regenerative Circuits) . Moscow, Gosenergoizdat, 1959. 311 p. 12,000 copies printed.

Ed.: S. S. Akalunin; Tech. Ed.: G. Ye. Larionov.

PURPOSE: This book is intended for scientific workers and engineers interested in problems of transistor application, and for advanced students specializing in radio physics.

COVERAGE: The book is devoted to investigation of physical processes occurring in transistorized feedback circuits, including generators of quasi-harmonic oscillations, relaxation oscillators with transformer feedback (blocking oscillators, converters), and in relaxation oscillators with RC feedback (multivibrators, triggers). The book begins with a systematic presentation of

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basic physical processes occurring in the transmission of electric signals through transistors. Material is based on the results of investigations made by the department of wave theory at the physics division of MGU, where samples of Soviet alloy-type transistors were used. No personalities are mentioned. References follow each chapter.

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9(2,3)
AUTHORS: Az'yan, Yu.M., Kaptsov, L.N., Rzhevkin, K.S., Senatorov, K.Ya.

TITLE: The Terminology Problem in the Field of Semiconductor Electronics

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1959, Vol 2, Nr 3, pp 372-374 (USSR)

ABSTRACT: The authors refer to the article (Ref.1) by T.M. Agakhanyan, B.N. Kononov and V.P. Stepanenko titled "The Terminology in the Field of Transistor Electronics", published in Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1958, Vol 1, Nr 4. The authors agree in principle with the content of this article but present some of their own ideas and recommendations. They followed the pattern of ref.1 and divided the article in General Problems, Junctions and Contacts, Diodes, Triodes, Triode Parameters and Circuit Problems. They believe that the term "tranzistor" (transistor) should be replaced by the term "poluprovodnikovyy triod" ("semiconductor triode"), since there is no other term in Russian for "poluprovodnikovyy diod" (semiconductor diode). Two entirely different terms should not be used for designating two closely related devices. The majority of the other suggestions con-

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The Terminology Problem in the Field of Semiconductor Electronics

tained in ref.1 were acknowledged by the authors of this article as being correct. There is 1 Soviet reference.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta imeni M.V. Lomonosova (Faculty of Physics of the Moscow State University imeni M.V. Lomonosov).

SUBMITTED: February 16, 1959

Some Features of the Transient Characteristics of Transistors at Small Signals

Secondly, the static capacitance of the p-n junction is taken into account; this is given by Eq (3), which was derived by W. Shockly (Ref 1). Also, the diffusion capacitance, given by Eq (4), should be taken into account (G. Early - Ref 4). A transistor can therefore be represented by means of a circuit consisting of two quadripoles connected in series (Figure 4), where the first quadripole represents the p-n junction and the second describes the base circuit. The equivalent circuit of the emitter junction is in the form of a $C_э r_э$ network, shown in Figure 5. The emitter current can thus be written in the form of Eq (5). The total output current can be determined by combining Eqs (5) and (1) by means of a Duhamel integral and is in the form of Eq (6). When the emitter time constant is small, Eq (6) can be written as Eq (7). The above equations are employed to plot the transient characteristics for transistors operating under various conditions. Figure 8 shows three curves.

Some Features of the Transient Characteristics of Transistors at Small Signals

Curve 2 was calculated for the emitter time constant of 4 μsec; Curve 1 represent the experimental characteristic, while Curve 3 gives the theoretical characteristic which was calculated for a medium value of the emitter constant for the current interval 0 to 1 μA; all the curves are evaluated for the emitter input pulse of 1 μA. Figure 9 shows one theoretical and two experimental characteristics. Curve 1 was taken experimentally at the bias current of 100 μA and an input pulse of 5 μA; Curve 3 was taken in the absence of a bias, the pulse current being 5 μA; Curve 2 was calculated by the method of linear approximation for the no-bias condition and for the pulse current of 5 μA. The experiments, i.e. the investigation of the transient characteristics, were carried out by using the circuit of Figure 10. The output resistance of the pulse generator was $R = 300\ k\Omega$, while the load resistor R_H was 1 000 Ω. The capacitance of the emitter junction

Some Features of the Transient Characteristics of Transistors at Small Signals

was measured by employing the resonant circuit shown in Figure 11. The capacitance could be determined from Eq (9a) provided the emitter resistance was known; this could be evaluated by measuring the slope of the current-voltage characteristic of the emitter (Figure 12). The experimental curves illustrating the dependence of the emitter capacitance on the biasing current is shown in Figures 13 (both for negative and positive currents). From the experiment and the theory, it is concluded that at small positive biassing currents at the emitter, the speed of the transient is primarily dependent on the static capacitance while the processes occurring in the base of the transistor are of little importance (the diffusion capacitance). There are 13 figures, 12 references,

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Some Features of the Transient Characteristics of Transistors at Small Signals

of which 5 are English and 7 Soviet; 2 of the Soviet references are translated from English.

SUBMITTED: April 16, 1958

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6.9411 (2903, 3703)
9,4310 (1143, 1150)

AUTHORS: Kaptsov, L.N., Kurochkin, V.A. and Senatorov, K.Ya.

TITLE: Investigation of Low Frequency Noise in Alloyed and Diffusion Transistors

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.12, pp. 2062-2063

TEXT: The dependence of the noise figure F of a number of transistors (types П1 (P1), П5 (P5), П6 (P6), П401 (P401), П402 (P402) and П403 (P403) on frequency in the range from 0.4 to 47 kc/s was investigated experimentally at the Laboratoriya impul'snykh protsessov kafedry teorii kolebaniy, MGU (Laboratory of Pulse Processes of the Chair of Oscillation Theory of the Moscow State University). The effect of the operating conditions and the magnitude of the internal resistance of the signal source was also studied. The measurements were carried out by the substitution method. The noise of a transistor was estimated by comparing with and measuring the noise level in an ohmic resistance of a known value. The equipment permitted the measurement of F in the range of 1 to 70 db with an absolute error of ± 0.5 db. Ten samples of each of the above types were measured. The results of the

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Investigation of Low Frequency Noise in Alloyed and Diffusion Transistors

measurements of F as a function of frequency f are shown in Fig.1. The dependence of F on the operating conditions was determined at frequencies from 1 to 25 kc/s and the results showing F as a function of the emitter current are given in a figure. From these experimental data it is found that F of the diffusion transistors increases with increasing emitter current much faster than in the alloyed transistors. The dependence of F on the collector voltage was also investigated experimentally (the resulting data are shown in a figure). From these it is found that F for both the diffusion and alloyed transistors is practically independent of the collector voltage at the frequency of 22 kc/s. On the other hand, F at 1 kc/s increases with the collector voltage in the alloyed transistors but is practically constant in the diffusion transistors. It was found that the optimum values of the internal resistance, which give a minimum F, lie in the range 400 to 1000 Ohms. There are 3 figures.

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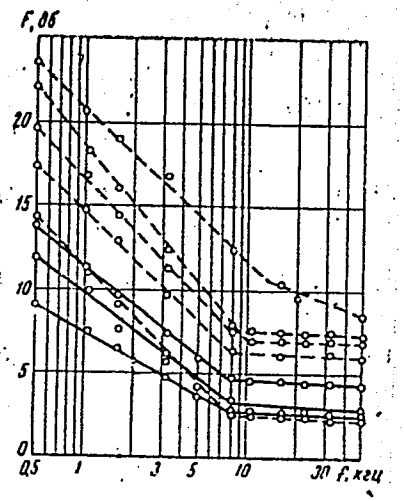
Investigation of Low Frequency Noise in Alloyed and Diffusion Transistors

Fig.1



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